

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. An apparatus for tensioning a shaft-mounted helical spring having a first end  
5 fixed to a building support and a second end anchored to a spring cone lockably mounted  
on the shaft, said apparatus comprising:
  - (a) a ratchet wheel assembly comprising;
    - a.1 a trunnion having a substantially semi-cylindrical inner surface  
with a diameter slightly greater than the shaft diameter, and having  
10 a concentrically semi-cylindrical outer surface defining an open  
side; and
    - a.2 a pair of primary ratchet wheels, each having a centroidal opening  
plus a radial slot contiguous with the centroidal opening and  
15 extending therefrom to the wheel's perimeter and defining a gap in  
said perimeter, the diameter of the centroidal opening and the  
minimum width of the radial slot each being greater than the shaft  
diameter, said perimeter defining a continuous plurality of  
uniformly-spaced cogs between the edges of the perimeter gap,  
said primary ratchet wheels being spaced apart and coaxially  
20 mounted to the trunnion with their radial slots aligned with the  
open side of the trunnion such that the ratchet wheel assembly may  
be positioned substantially coaxially over the shaft;
  - (b) a pair of bridging members, each bridging member being associated with a  
corresponding one of the primary ratchet wheels; each bridging member  
25 defining an arcuate-edged section substantially matching the diameter of  
the primary ratchet wheel, said arcuate-edged section defining a plurality  
of cogs configured and spaced to match the cogs of the primary ratchet  
wheel over an arcuate length at least equal to the arcuate length of the  
perimeter gap of the corresponding primary ratchet wheel; and each  
30 bridging member being selectively operable between:

- 5                   b.1     an engaged position, in which the arcuate-edged section bridges the perimeter gap of the primary ratchet wheel such that the cogs of the bridging member and the primary ratchet wheel combine to form a continuous and uniformly-spaced series of cogs; and
- b.2     an open position, in which the arcuate-edged section is substantially clear of the perimeter gap and radial slot of the primary ratchet wheel so as to permit positioning of the ratchet wheel assembly coaxially over the shaft;
- 10               (c)     locking means, for locking the bridging member in the open position;
- (d)     spring cone engagement means, for releasably engaging the spring cone such that the spring cone will rotate with the ratchet wheel assembly; and
- 15               (e)     a pair of levers, each lever having a hub section rotatably mountable around the outer surface of the trunnion in association with one of the primary ratchet wheels, each lever having a pawl member with an inner end and an outer end, said inner end defining a cog-engaging surface and a non-engaging surface, each pawl member being mounted to its corresponding lever such that the pawl member may be retractably extended such that the cog-engaging surface may engage the cogs of one of the primary ratchet wheels and its corresponding bridging member.

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2.     The apparatus of Claim 1 wherein the trunnion comprises a substantially semi-cylindrical sleeve.
3.     The apparatus of Claim 1 wherein the primary ratchet wheels are mounted at opposite ends of the trunnion, such that each lever may be rotated around the outer surface of the trunnion at a point inboard of its corresponding primary ratchet wheel.
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4.     The apparatus of Claim 1 wherein each of the primary ratchet wheels is mounted at a point inboard of one end of the trunnion, such that each lever may be rotated around the outer surface of the trunnion at a point outboard of its corresponding primary ratchet wheel.
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5. The apparatus of Claim 1 wherein at least one bridging member is an auxiliary ratchet wheel having a centroidal opening plus a radial slot contiguous with the centroidal opening and extending therefrom to the auxiliary wheel's perimeter and defining a gap in said perimeter, wherein:
- 5 (a) both the diameter of the centroidal opening and the minimum width of the radial slot are greater than the shaft diameter;
- (b) the perimeter of the auxiliary wheel defines a plurality of cogs uniformly spaced over an arcuate length at least equal to the arcuate width of the perimeter gap of the corresponding primary ratchet wheel;
- 10 (c) the configuration and spacing of the cogs of the auxiliary ratchet wheel substantially conform with the configuration and spacing of the cogs of the corresponding primary ratchet wheel; and
- (d) the auxiliary ratchet wheel is coaxially and rotatably connectable to the corresponding primary ratchet wheel, such that the auxiliary ratchet wheel may be rotatably operated between the open and engaged positions.
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6. The apparatus of Claim 1 wherein:
- (a) at least one bridging member is hingedly mounted to its corresponding primary ratchet wheel, so as to be hingedly movable between the open and engaged positions; and
- 20 (b) when the bridging member is in the engaged position, the cogs thereof lie in substantially the same plane as the cogs of the ratchet wheel.
7. The apparatus of Claim 1 wherein:
- (a) at least one bridging member is hingedly mounted to its corresponding primary ratchet wheel, so as to be hingedly movable between the open and engaged positions; and
- 25 (b) when the bridging member is in the engaged position, the cogs thereof lie in a plane offset from the plane of the cogs of the ratchet wheel.
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8. The apparatus of Claim 1 wherein at least one bridging member is swivellably mounted to its corresponding primary ratchet wheel about an axis substantially parallel to the centroidal axis of the ratchet wheel, such that the bridging member is swivellably movable between the open and engaged positions.
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9. The apparatus of Claim 1 wherein the locking means of at least one bridging member comprises a fastener removably engageable through an opening in the bridging member and a mating opening in the corresponding primary ratchet wheel.
- 10 10. The apparatus of Claim 9 wherein the fastener is a bolt, and the mating opening in the primary ratchet wheel is a threaded opening.
11. The apparatus of Claim 9 wherein the fastener is a pin.
- 15 12. The apparatus of Claim 11 wherein the pin is a spring-loaded pin retainably mounted to the bridging member.
13. The apparatus of Claim 1 further comprising pawl biasing means, for biasing the pawl member inwardly.
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14. The apparatus of Claim 13 wherein the pawl biasing means comprises a spring.
15. The apparatus of Claim 1 further comprising pawl orientation means, for selectively orienting the cog-engaging surface of the pawl member to accommodate rotation of the ratchet wheel assembly in either direction.
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16. The apparatus of Claim 15 wherein the pawl orientation means comprises a rotatable handle associated with the outer end of the pawl member.
- 30 17. The apparatus of Claim 1 wherein the hub section of at least one lever comprises a substantially semi-cylindrical bushing element having an inner diameter slightly greater

than the diameter of the outer surface of the trunnion, said bushing element being matingly and rotatably engageable with said outer surface of the trunnion.

18. The apparatus of Claim 17 wherein the hub section further comprises pawl  
5 alignment means, to facilitate positioning of the hub section on the trunnion so as to align the pawl member with the cogs of one of the primary ratchet wheels and its corresponding bridging member.

19. The apparatus of Claim 18 wherein:

- 10 (a) the trunnion further comprises a rub plate mounted to the trunnion adjacent one of the primary ratchet wheels, in a plane substantially perpendicular to the axis of the trunnion, said rub plate having a radial slot with a minimum width greater than the diameter of the outer surface of the trunnion, and said radial slot being substantially aligned with the open side  
15 of the trunnion; and
- (b) the pawl alignment means comprises a guide member positioned such that when the lever is rotated with guide member in contact with said rub plate, the pawl member will be aligned so as to be engageable with the cogs of both the primary ratchet wheel and its corresponding bridging member.

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20. The apparatus of Claim 19 wherein the guide member is a plate oriented substantially perpendicular to the centroidal axis of the bushing element.

21. The apparatus of Claim 1 wherein the spring cone engagement means comprises a  
25 bracket having at least one sleeve oriented radially relative to the axis of the trunnion, each sleeve having a cone-engaging pin slidable within said sleeve and adapted for removable insertion into a socket of the spring cone, such that rotation of the ratchet wheel assembly with the pin inserted into the spring cone socket will induce exert a rotational force on the spring cone.

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22. The apparatus of Claim 21, further comprising a spring for biasing the cone-engaging pin radially inward such that upon insertion into a spring cone socket the pin will tend to remain inserted therein.
- 5 23. The apparatus of Claim 21 wherein the sleeve defines an L-shaped slot having a first leg and a second leg, and wherein the cone-engaging pin has an operating wand projecting through and slidable within said slot, such that:
- (a) movement of the wand within the first leg away from the intersection of the slot legs will move the pin radially outward;
  - 10 (b) movement of the wand within the first leg toward the intersection will move the pin radially inward; and
  - (c) movement of the wand with the second leg away from the intersection will substantially prevent radial movement of the pin.
- 15 24. The apparatus of Claim 1 wherein the spring cone engagement means is mounted to one of the bridging members.
25. The apparatus of Claim 1 wherein the spring cone engagement means is mounted to one of the primary ratchet wheels.

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